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PATENT APPLICATION

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES**

In re application of

Akira YAMAGUCHI

Appln. No.: 09/289,600

Confirmation No.: 8833

Filed: April 12, 1999

For: MONOCHROMATIC IMAGE DISPLAY SYSTEM

Docket No: Q53967

Group Art Unit: 2674

Examiner: Jean E. LESPERANCE

SUBMISSION OF APPEAL BRIEF

MAIL STOP APPEAL BRIEF - PATENTS
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

Submitted herewith please find an Appeal Brief. A check for the statutory fee of $500.00 is attached. The USPTO is directed and authorized to charge all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account. A duplicate copy of this paper is attached.

Respectfully submitted,

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WASHINGTON OFFICE
23373
CUSTOMER NUMBER

Date: February 3, 2005

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APPEAL BRIEF UNDER 37 C.F.R. § 41.37

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Alexandria, VA 22313-1450

Sir:

In accordance with the provisions of 37 C.F.R. § 41.37, Appellant submits the following:

Table of Contents

I. REAL PARTY IN INTEREST

The real party in interest in this appeal is Fuji Photo Film Co., Ltd. of Japan. The assignment was recorded on August 11, 1999 at Reel 010160, Frame 0606.

II. RELATED APPEALS AND INTERFERENCES

To the knowledge of the Appellant, Appellant's representatives and assignee, there are no known related appeals or interferences that i) are related to the present appeal, ii) would affect or be affected by the outcome of this appeal, or iii) or would have any bearing on the outcome of this appeal.

III. STATUS OF CLAIMS

Claims 1-29, 31 and 35-38 remain pending in the application. Claims 30 and 32-34 have been cancelled. Claims 16-17 and 19-20 have been deemed allowable over the art of record but are objected to for depending on rejected base claims.

Claims 1-15, 18, 21-29, 31, 35-38 are rejected under 35 U.S.C. § 103 as being unpatentable over Suga (U.S.P. 5,739,808) in view of Chang (U.S.P. 5,872,554).

The rejection of claims 1-15, 18, 21-29, 31 and 35-38 is being appealed.

Appellant submits that the rejection of claim 21 appears to be in error as claim 21 is dependent on claim 20 which has been deemed allowable by the Examiner.

IV. STATUS OF AMENDMENTS

The Submission filed on August 18, 2004 included no amendments. The comments set forth therein are believed to have been entered and made of record.

V. SUMMARY OF THE CLAIMED SUBJECT MATTER

Applicant's invention relates to a monochromatic image display. Conventional monochromatic displays provide an output using time and intensity modulation. However, these displays provide only a limited number of tones. Page 2, lines 6-15. Additionally, medical images are conventionally provided on a blue-base film, and thus conventional medical practice has created a preference for monochromatic blue-based electronic display outputs. Page 4, lines 10-21. When a color display of R,G,B outputs is used to display a monochromatic medical image, the maximum luminance level achieveable is only 100 to 200 cm/m^2 which is far below the luminance of 5000 to 6000 cd/m^2 achievable using a light box.

Applicant's invention overcomes the above deficiencies to provide a monochromatic display capable of displaying a large number of tone levels and with adequate luminance. An exemplary embodiment of the claimed invention (e.g. claim 1) is described with reference to Fig. 1, illustrating a display device. Each picture element 41 includes multiple spatially adjacent cells 41a, 41b, 41c and is provided with a tone conversion processing means which carries out a tone number conversion on an original monochromatic image signal Sorig, and generates a monochromatic image signal So. A cell generating means 10 includes time modulation device 12 and on-off control device 13. Page 32, lines 13-23. Based on monochromatic signal So, the time modulation device of the cell signal generating means outputs cell signals Sa, Sb and Sc which respectively determine the output tone levels of the cells 41a, 41b and 41c of the picture element 41. On-off control device 13 receives the signals Sa, Sb, Sc from respective time modulation devices. The cell generating means 10 generates signals for the cells 41a, 41b, 41c

so that the average of the output luminances of the cells 41a, 41b, 41c correspond to the output luminance of the picture element 41. Page 8, lines 12-19. The time modulation device 12 divides a unit time into multiple time segments to carry out a time division drive in which the input signal is selectively turned on and off. Figs. 4-5 show different levels expressed by each of the cells. Page 35, line 11 to Page 36, line 9. As an alternative embodiment, the time modulation means may be directly input to respective cells. Page 36, lines 2-9. The number of cells per picture element can be extended to various numbers, such as shown in Fig. 18. Page 60, lines 9-14. The cells of a color display can be made of monochromatic form by replacing color filters with monochromatic filters. Page 60, line 24 to Page 61, line 2.

As a further alternative embodiment of the claimed cell signal generating means, intensity modulators (Fig. 7, elements 51a, 51b, 51c) provide on-off signal control to respective cells of a picture element. Page 41, line 19 to page 42, line 12. The levels illustrated by Figs. 4-5 can be expressed by time and/or intensity modulation. Page 32, lines 2-9.

With the cell signal generating means of the present invention, adequate luminance range can be achieved, such as 500 cd/m^2 to 5000 cd/m^2, thereby obviating a deficiency of conventional color display devices displaying a monochrome image. Page 64, lines 18-26. (Claim 21).

Additional independent claims 13 and 38 include features similar to that discussed above for claim 1. Additionally, with regard to claim 13, this claim describes a drive means for cells of respective picture elements so that the output level difference for one level of the cell levels

differs from another of the two series of cells. Page 59, line 22 to Page 60, line 1. This is to further increase a number of different tone representations per picture element.

With regard to claim 38, this claim describes that a sum of the output luminances of all the cells within a picture element corresponds to an output luminance of the picture element. Page 33, lines 16-20.

In an exemplary embodiment, the monochromatic image falls in a color range surrounded by points (0.174,0), (0.4, 0.4) and (α, 0.4) in a CIE chromaticity diagram, where α represents the x coordinate of a spectrum locus and line y=0.4. (Claims 18, 29. Fig 20 and page 61, lines 9-20).

VI. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

The grounds of rejection to be reviewed on appeal include the rejections of claims 1-15, 18, 21-29, 31 and 35-38 over Suga in view of Chang.

VII. ARGUMENT

A. There is no motivation to combine the teachings of Suga with Chang to support the §103 rejection of independent claims 1, 13 and 38 and their dependent claims.

Suga discloses a method and apparatus for displaying a color image on a display that has a higher resolution than the source image. *See* Suga col. 2, lines 19-24. Each pixel in the display includes R, G, B components (Fig. 3). Each pixel of a source image can be displayed using NxM pixels of the output display. *See, e.g.,* Suga col. 2, lines 25-32. The display is a two-state FLCD panel, requiring a binarization process to convert a multi-bit input image for 1-bit display. *See* Suga col. 1, line 43 to col. 2, line 4. In converting each pixel of the input image to MxN pixels for display, the apparatus of Suga uses a "multi-gradationing process." *See* col. 2, lines 45-53. Suga teaches a half-toning method, rendering variations of color of an original image by means of a plurality picture elements. Depending on the relationship of an input data in comparison to a threshold table, a value for a cell will be assigned to a threshold level and any excess over the threshold will be diffused to adjoining data. Col. 5 lines 4-15; Fig. 12. An alternative conversion depends on the position of the pixel data in dither matrix in relation to one of several thresholding tables.

As disclosed at col. 5, lines 31-34, "[d]ata which was multi-value halftone processed by the above-mentioned halftone process unit 103 is converted into ON/OFF data of the binary display device, that is, converted into binary data of '1'or '2'." As demonstrated in Figs. 14A-14D of Suga, this multi-value halftone is displayed as a stable (*i.e.,* not time modulated) binary output. *See* Suga col. 5, lines 31-64. In other words, a fixed image is displayed for the entirety of one frame of the original image. *See* also Suga, Fig. 15, display line.

Chang simulates grayscale on a monochrome LCD to obviate blinking effects in a displayed image. Abstract. In Chang, the exemplary resolution of the image is 3 x 3. *See* Chang column 4, lines 9-11. Thus, in Figs. 1 and 2, there are nine picture elements, each picture element addressing a single cell of a monochrome screen. The cells in Chang are monochrome, each cell having N-levels of simulated grayscale formed from N-1 pages. Each cell in Chang is individually addressed, such that an output luminance/level must be specified for each of the 9 cells of the 3x3 image. *See* Chang column 3, line 45 to column 4, line 42. Specifically, each cell is addressed based on its X-Y coordinate in the image, using a "mod" function to determine the on-off page sequence of each cell for a respective level of grayscale. In Figure 2 of Chang, for different gray levels (light gray and dark gray), the cells that are on or off will change over the three pages to represent grayscale while obviating blinking caused by the condition of conventional grayscale methods (Fig. 1).

Referring to Fig. 3 of Chang, the monochrome image is stored in ROM module 12, and is output as a grayscale image to the CPU 11. *See* column 5, lines 22-23. The CPU 11 converts the monochrome image into (N-1) pages of on-and-off signals (V_{rm3}, V_{rm0}) that are sequentially applied to the LCD to simulate a desired gray level for each picture element of the image. *See* column 5, lines 43-53. The pages are generated by applying a "mod" function to generate the series of on-and-off pages for each cell of the 3 x 3 image, based on the gray level needed for each respective picture element of the grayscale image. *See* column 3, line 37 to column 4, line 42. Each page is sequentially transferred LCD row and column drivers 16 and 17 so as to display the pages one-at-a-time on the LCD screen 18. *See* column 5, lines 32-35. The

waveforms of the signals FR, FP, LP, and SCP, are used for synchronization. *See* column 5, lines 36-42.

The Examiner concedes that Suga fails to teach a monochrome display, and then cites Chang to correct this deficiency, The Examiner contends it would be obvious to include the display control method of Chang into Suga to obviate a blinking effect. Appellant submits the motivation to combine Suga and Chang is improper for at least six reasons.

First, the Examiner's proffered reason to use the monochrome display in Chang in the apparatus of Suga is to provide the grayscale without a blinking effect. Final Rejection, Page 4, Detailed Action. However, the obviating of the blinking effect is peculiar to the monochrome display for displaying grayscale. The Examiner readily concedes that Suga is already capable of multiple level outputs (Advisory Action). Accordingly, there is no reason one skilled in the art would include the display method of Chang in Suga for purposes of multi-level data representation. Appellant would further submit that monochrome approach of Chang would not prevent a blinking effect when applied to a color display that is supplied at a constant level over a frame. The constant frame condition in Suga already obviates any blinking.

Second, whereas Suga displays a fixed binary image for the entirety of one frame of the original image (See Fig. 15, display line showing constant data per frame), Chang renders images using time-modulation, turning each pixel on-and-off multiple times in the period of one frame in order to simulate a level of grey, where the pixel that is turned on may vary over the course of the frame. Specifically, each frame is rendered by a series of black-and-white pattern pages. It is the successive display of pages that permits the grayscale simulation in Chang, and

thus the time basis change is a fundamental aspect of display control in Chang. Suga and Chang utilize completely different display methods. Therefore, Appellant submits that there is no suggestion nor motivation to combine Suga and Chang. Nor is it clear that the "invention" of Suga could even be modified to utilize such time-modulation.

Third, relatedly, the error diffusion for color error and the dither matrix for the color data of Suga would not be compatible with distribution of monochrome data, where the data changes continuously over one frame as in Chang. The sub-pixel variation needed in Chang would make the thresholding in Suga impossible to implement. This is because the Suga conversion for the output display is position-dependent under either the diffusion or dither matrix approach. The operational incompatibility in the display control underscores the clear use of hindsight construction in maintaining the rejection of the claims. The references teach away from their combination with each other at a fundamental level.

Fourth, the references relate to different types of displays. While Suga relates to an R, G, B color display, Chang relates to a monochrome display. Notably, the object of Chang relates to representation of grayscale using the monochrome (e.g. black and white) display using a constantly changing dark pattern to represent pixels in a frame. Since Suga relates to a color display, the use of grayscale is not compatible with the color display. Because Suga pertains to a high quality resolution representation, it is not obvious to degrade the display methodology to a monochrome grayscale. Since the grayscale of Chang is represented by changing page patterns per frame, the amount of grayscale representation is limited, and the resolution is implicitly low.

Fifth, to the extent the Examiner attempts to draw an analogy to the FLCD of Suga and the monochrome LCD of Chang, that analogy does not support the rejection. The FLCD of Suga still relates to an RGB device, not a monochrome device. For this additional reason, the record fails to include a supportable basis to use a monochrome display in Suga. As discussed above, the error diffusion or dither required in Suga would not be compatible with the use of time-varying grayscale and would lead to degraded results, thereby undermining a principle object in Suga.

Sixth, the Examiner contends in the Advisory Action that the teachings of the high resolution color device of Suga would be compatible with Chang since Suga can be applied to binary and multi-valued devices. This does not negate that achievement of the improved resolution in Suga stems from multiple color, not monochrome outputs, per pixel. Moreover, this would not negate the fact that time modulation in Chang is not consistent with a stable output frame per color in Suga.

Because the combination of Chang and Suga is inappropriate for at least the above reasons, Appellant requests withdrawal of the rejections of independent claims 1, 13 and 38. The remaining claims are patentable based on their dependency.

A.1 The combination of Suga and Chang does not teach the sum of luminance of the cells corresponding to an output of the picture element. (claim 38).

The respective picture element luminance of claim 38 depends on the sum of monochromatic cell outputs. The Examiner does not appear to have addressed this aspect of claim 38 in the rejections. Appellant submits that because Suga relates to a color output R, G, B, the luminance per pixel will necessarily **not** correspond to the sum of luminance for only a single

color. Chang does not correct this deficiency. Therefore, claim 38 is patentable for at least this reason, separately from the remaining claims rejected over Suga and Chang.

A.2 The combination of Suga and Chang does not teach the average of output luminances of the cells corresponding to an output of the picture element. (claim 38).

In contrast to claim 38, the respective picture element luminance of claim 1 depends on an average of monochromatic cell outputs. The Examiner's rejection appears to shift on this issue. In the Final Office Action, the Examiner relies on thresholding and diffusion of error difference as teaching of the average cell luminance. Detailed Action, page 3. However, the error diffusion and thresholding of Suga clearly does not correspond to an average of monochrome cells. Specifically, the difference between an input signal and a threshold and allocating the difference over adjacent picture elements bears no relation to an average luminance. In the Advisory Action, the Examiner appears to implicitly acknowledge the weakness of the initial reliance on Suga and cites Chang Fig. 6 to support the averaging aspect. However, in Chang, the effective voltage is applied on a per pixel basis. There is no reference to an average of cell luminance as claimed. This further underscores the impropriety of applying a time variable voltage per page per pixel of Chang to the stable voltage application of Suga.

Therefore, Appellant submits that at least one, if not both, of the rejections of claim 1 or claim 38 should be withdrawn.

A.3 The combination of Suga and Chang does not teach representation in the CIE chromaticity diagram described by claims 18 and 29.

Claims 18 and 29 describe boundaries for the monochromatic representation of an output. Such an output corresponds to a medical image color range that may be replicated from a film

and light box, for example. While the Examiner cites various synchronization signals in Chang, this does not explain how the art of record teaches or suggests the chromaticity as claimed. Claims 35-36 are further patentable based on their dependency.

A.3 The combination of Suga and Chang does not teach an output luminance in a range 500cd/m^2 to 5000cd/m^2. (Claim 21).

As discussed above in Section III, the rejection of claim 21 appears to be in error. To the extent the rejection is maintained, Appellant notes that the Examiner contends the luminance range is met based on disclosure of certain display types. However, the claimed luminance is not a necessary output simply due to the display type. Therefore claim 21 should be allowed.

Conclusion

In view of the foregoing, Appellant submits that the pending rejection over Suga and Chang should be withdrawn.

Unless a check is submitted herewith for the fee required under 37 C.F.R. §41.37(a) and 1.17(c), please charge said fee to Deposit Account No. 19-4880.

The USPTO is directed and authorized to charge all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account.

Respectfully submitted,

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WASHINGTON OFFICE
23373
CUSTOMER NUMBER

Date: February 3, 2005

CLAIMS APPENDIX

CLAIMS 1-15, 18, 21-29, 31 and 35-38 ON APPEAL:

1. A monochromatic image display system comprising:

a display device comprising a plurality of picture elements, each picture element comprising a series of spatially adjacent cells, each cell emitting light in a same color and expressing tones in three or more levels; and

a cell signal generating means which generates, based on a monochromatic image signal indicating an output luminance of each picture element of a monochromatic image, a cell signal for each spatially adjacent cell of a respective picture element of said display device, said cell signal determining an output tone level of the cell, so that an average of the output luminances of all the cells within each respective picture element correspond to an output luminance of the respective picture element,

wherein each respective picture element of said display device corresponds to a picture element of said monochromatic image, and

wherein the output luminances of the plurality of picture elements of said display device express said monochromatic image.

2. A monochromatic image display system as defined in Claim 1 in which the cell signal generating means generates cell signals so that the output luminances of the cells of the respective picture element of said display device are substantially uniform.

3. A monochromatic image display system as defined in Claim 1 in which the cell signal generating means generates cell signals so that the output luminances of the cells of the

respective picture element of the display device change at an inclination according to a tone gradient vector of picture elements around the respective picture element corresponding to the cells.

4. A monochromatic image display system as defined in Claim 1 in which the cell signal generating means intensity-modulates input signal levels to the respective cells independently of each other.

5. A monochromatic image display system as defined in Claim 1 in which the cell signal generating means time-modulates input signal levels to the respective cells independently of each other.

6. A monochromatic image display system as defined in Claim 5 in which the cell signal generating means time-modulates input signal levels to the respective cells by frame.

7. A monochromatic image display system as defined in Claim 6 in which the cell signal generating means determines the output tone level of each cell so that the output luminances of frames are substantially uniform.

8. A monochromatic image display system as defined in Claim 6 in which the maximum number of tones which can be expressed by each cell per one frame is not smaller than 64 (6 bits).

9. A monochromatic image display system as defined in Claim 1 further comprising a tone number conversion means which carries out a tone number conversion processing on an input original monochromatic image signal, thereby generating said monochromatic image signal, wherein a number of tones represented by said monochromatic image signal is no greater

than a number of tones which can be expressed by each respective picture element of said display device.

10. A monochromatic image display system as defined in Claim 9 in which the number of tones represented by the original monochromatic image signal is not smaller than 256 (8 bits).

11. A monochromatic image display system as defined in Claim 1 in which the display device expresses each picture element by three cells.

12. A monochromatic image display system as defined in Claim 1 in which the display device is a liquid crystal panel.

13. A monochromatic image display system comprising:

a display device comprising a plurality of picture elements, each picture element comprising a series of spatially adjacent cells, each cell emitting light in a same color and expressing tones in three or more levels, and at least two of said series of cells having maximum output levels different from each other; and

a drive means which drives the cells of a respective picture element so that the output level difference per one level of said three or more levels differs from each other between said at least two of said series of cells,

wherein the plurality of picture elements express a monochromatic image.

14. A monochromatic image display system as defined in Claim 13 in which the maximum output level of one of said at least two cells is substantially the same as the output level difference per one level of the other cell.

15. A monochromatic image display system as defined in Claim 14 in which the drive means drives the cells so that said at least two cells express tones in substantially the same number of levels.

18. A monochromatic image display system as defined in claim 1, wherein said display device is further characterized as being a flat panel-like display device, and is further characterized in that the display device is a monochromatic display device which makes a display in said same color which falls within the region surrounded by points (0.174, 0), (0.4, 0.4) and (α, 0.4) as represented by co-ordinates (x, y) on a CIE chromaticity diagram,

wherein α represents the x-coordinate of the intersection of a spectrum locus and a straight line y=0.4.

21. A monochromatic image display system as defined in Claim 20 in which the maximum luminance of each picture element is in the range of $500cd/m^2$ to $5000cd/m^2$.

22. A monochromatic image display system as defined in Claim 18 in which the display device is a liquid crystal panel.

23. A monochromatic image display system as defined in Claim 18 in which the display device is an organic EL panel.

24. A monochromatic image display system as defined in Claim 4, wherein:

there are M cells in each picture element;

there are L tones expressible by intensity modulation of each cell, excluding a zero tone level;

the zero tone level is expressed when the input signals into each of the cells of a respective picture element are turned off; and

each picture element has a range of M x L + 1 tones, including the zero tone level.

25. A monochromatic image display system as defined in Claim 5, wherein:

there are M cells in each picture element;

there are N tones expressible by time modulation of each cell, excluding a zero tone level;

the zero tone level is expressed when the input signals into each of the cells of a respective picture element are turned off; and

each picture element has a range of M x N + 1 tones, including the zero tone level.

26. A monochromatic image display system as defined in Claim 1 in which the cell signal generating means intensity-modulates and time-modulates the input signal levels to the respective cells independently of each other.

27. A monochromatic image display system as defined in Claim 26, wherein:

there are M cells in each picture element;

there are L tones expressible by intensity modulation of each cell, excluding a zero tone level;

there are N tones expressible by time modulation of each cell, excluding the zero tone level;

the zero tone level is expressed when the input signals into each of the cells of a respective picture element are turned off; and

each picture element has a range of M x L x N + 1 tones, including the zero tone level.

28. A monochromatic image display system as defined in Claim 1, wherein:

at least two of said series of cells have maximum output levels different from each other; and

said cell signal generating means generates the cell signal for each cell so that the output level difference per one level differs from each other between said at least two of said series of cells.

29. A monochromatic image display system as defined in Claim 1, wherein said display device is a monochromatic display device which makes a display in said same color which falls within a region surrounded by points (0.174, 0), (0.4, 0.4) and (α, 0.4) as represented by co-ordinates (x, y) on a CIE chromaticity diagram, wherein α represents an x-coordinate of an intersection of a spectrum locus with a straight line y=0.4.

31. A monochromatic image display system as defined in Claim 19, wherein said at least one of elements is formed of polyethylene terephthalate colored with an anthraquinone dye to a color of said predetermined color.

35. A monochromatic image display system as defined in Claim 18, wherein said same color is blue.

36. A monochromatic image display system as defined in Claim 29, wherein said same color is blue.

37. A monochromatic image display system as defined in Claim 9, wherein a number of tones represented by said input original monochromatic image signal is greater than said number of tones represented by said monochromatic image signal.

38. A monochromatic image display system comprising:

a display device comprising a plurality of picture elements, each picture element comprising a series of spatially adjacent cells, each cell emitting light in a same color and expressing tones in three or more levels; and

a cell signal generating means which generates, based on a monochromatic image signal indicating an output luminance of each picture element of a monochromatic image, a cell signal for each spatially adjacent cell of a respective picture element of said display device, said cell signal determining an output tone level of the cell, so that an sum of the output luminances of all the cells within each respective picture element correspond to an output luminance of the respective picture element,

wherein each respective picture element of said display device corresponds to a picture element of said monochromatic image, and

wherein the output luminances of the plurality of picture elements of said display device express said monochromatic image.

EVIDENCE APPENDIX:

Pursuant to 37 C.F.R. § 41.37(c)(1)(ix), submitted herewith are copies of any evidence submitted pursuant to 37 C.F.R. §§ 1.130, 1.131, or 1.132 or any other evidence entered by the Examiner and relied upon by Appellant in the appeal.

NONE

RELATED PROCEEDINGS APPENDIX

Submitted herewith are copies of decisions rendered by a court or the Board in any proceeding identified about in Section II pursuant to 37 C.F.R. § 41.37(c)(1)(ii).

NONE